TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

I. *Report on the Collection of Fishes made by Mr. J. E. S. Moore in Lake Tanganyika during his Expedition*, 1895–96. *By* G. A. Boulenger, *F.R.S.*, *F.Z.S.* *With an Appendix by* J. E. S. Moore, *A.R.C.S.*

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[Plates I.–VIII.]

The examination of the collection of fishes brought home from Lake Tanganyika by Mr. Moore, and with which I have been entrusted by him, has not yielded any such startling results as have already been announced after study of the Invertebrates [1]. Of the two series in the fauna of Tanganyika, distinguished by its explorer as the normal freshwater and the halolimnic groups [2], the latter is unrepresented in the collection. This may be due either to the origin of the present fish-fauna not reaching so far back in time as that of the Mollusca and other Invertebrates, or to the incompleteness of the series brought home. The latter explanation may be the correct one, since, owing to the lack of suitable dredging-apparatus, and to the difficulties of preserving, to which Mr. Moore has alluded [3], only a small proportion of the fishes of the Lake could be collected, mostly littoral forms found about the rocks; of the deeper-water fishes, which were observed to be abundant both in species and in individuals, we are still almost entirely ignorant; it is therefore to be expected that further collections,

[1] J. E. S. Moore, "On the Zoological Evidence for the Connection of Lake Tanganyika with the Sea," Proc. R. Soc. lxii. 1898, pp. 451–458.

[2] J. E. S. Moore, "The Molluscs of the Great African Lakes," Q. Journ. Micr. Sci. 1898, pp. 159–204.

[3] *L. c.* See also "The Physiographical Features of the Nyasa and Tanganyika Districts," Geogr. Journ 1897.

made under more favourable circumstances, would considerably modify our views on the general character of this most important section of the fauna.

How incomplete the collection is may be partly realized from the fact that, of the six species previously described from Tanganyika, only one was rediscovered by Mr. Moore. His series of sketches executed from fresh specimens, free use of which he has kindly given me, thus enabling me to represent some of the new species in their natural colours, also indicate the existence of several fishes which are unrepresented in the collection. Large fishes, owing to the impossibility of preserving them, had to be left behind, and the difficulties of transport by carriers resulted in the loss of several jars containing spirit-specimens. Nevertheless, small as it is, and though deficient in any but typically African freshwater forms, the collection is of great interest, and Mr. Moore well deserves the thanks of all zoologists for the manner in which, amid so many difficulties, he has succeeded in affording us a first glimpse at a fish-fauna which has so long remained a mystery.

A study of the freshwater fishes of Africa has hitherto led to the assumption that the bulk of the fauna originated in the region of the great lakes, whence they have radiated towards the Mediterranean and the Atlantic and Indian Oceans—a view based on the close affinity, often amounting to specific identity, of the fishes of the Nile, the Niger, the Congo, and the Zambesi. The homogeneity of the fauna is absolutely opposed to the conception of the great watersheds having been stocked from the sea, within the geological period of which these fishes are representative, this being evident even in the case of such forms as *Lates* and *Tilapia*, which are known to enter salt water. Nothing contrary to this theory is brought to light by an examination of the fishes obtained by Mr. Moore in Lake Tanganyika. The striking character of the Tanganyika fish-fauna, as revealed by Mr. Moore's collection, is the extraordinary variety of the *Cichlidæ* [1]. This is a natural group distributed all over Africa, including Madagascar. but, although rich in species, nowhere else showing within a limited area anything like the modifications of structure described in this report, which have necessitated the establishment of nearly as many new genera as were previously known from the whole of Africa. The generalized characters of some of the *Cichlidæ* occurring in Lake Tanganyika, regarding as indicative of generalization the greater development of the anal fin, consistently with the system followed in classifying their more primitive allies the *Centrarchidæ* [2], and the extent of the lateral lines, both of which are complete in some of the newly-discovered forms [3], afford further support to the

[1] See P. Z. S. 1898, p. 132.

[2] Cat. Fish. 2nd ed. i. p. 2 (1895).

[3] The lateral line has usually been described as "interrupted" in the *Cichlidæ* and other groups in which it has a similar disposition. This expression conveys a serious misconception, and I have replaced it in the diagnoses of the *Cichlidæ* and the *Serranidæ* allied to *Plesiops* by "lateral lines two," the necessity for this change being particularly obvious in the case of some of the species described in this report. Fishes had no doubt originally a greater number of lines of sense-organs along the body, as we may still observe in many of

proposition enunciated above. Lake Tanganyika might be regarded as the centre of origin of all the African genera of *Cichlidæ*.

Unfortunately, nothing reliable is yet known of this family in a fossil condition, with the exception of a few American Tertiary types, which do not differ materially from those inhabiting the same part of the world at the present time. There is no reason for referring to it the Cretaceous fishes from Mount Lebanon described as "Chromides" by Heckel [1] and by Davis [2]. All we can gather from Heckel's description is that *Pycnosterynx* is based on some "Pharyngognath Acanthopterygian," and that it does *not* belong to the *Cichlidæ* is conclusively proved by his statement: "Rippen kurz, dünn, die hinteren auf langen Querfortsätzen ansitzend," a sentence that has been translated by Davis as "Ribs short and slender, the posterior ones supporting long transverse apophyses" [3]. An examination of some of the specimens of *Pycnosterynx* exhibited in the British Museum suggests to me special relation to the *Berycidæ*, with which they are provisionally associated by Mr. Smith Woodward, and certainly no affinity to the *Cichlidæ*. Considering that coalesced lower pharyngeal bones occur at the present day in such widely different groups as the *Serranidæ*, *Gerridæ*, *Sciænidæ*, *Cichlidæ*, *Pomacentridæ*, *Embiotocidæ*, *Labridæ*, *Scaridæ*, *Pleuronectidæ*, and *Scombresocidæ*, this character, if correctly ascertained by Heckel, would in itself be no serious objection to the allocation of *Pycnosterynx* among the *Berycidæ*. Günther [4] also doubts the correctness of Heckel's determination when he states that "the position of *Pycnosterynx* is uncertain," but we are not enlightened as to its affinities by the further remark that "it approaches certain Pharyngognaths." It appears certain that true Perciform fishes, to which large group the *Cichlidæ* belong, have not yet been described from pre-Tertiary beds.

In order to show what is now known of the fish-faunas of the great lakes, lists are appended of the fishes of Lakes Nyassa, Tanganyika, Victoria Nyanza, and Rudolf. These lists must of course be taken as giving a very inadequate idea of the fauna, owing to the incompleteness of the collections on which they are based; but, imperfect as they are, they nevertheless will prove useful as a basis from which to judge of the relation existing between the piscine inhabitants of these lakes. Of the other lakes, unfortunately, nothing can be said at present, the occurrence of an undetermined species of *Haplochilus* in the Albert Nyanza being all the information we possess.

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the lower forms. In the Teleosteans, as a general rule, the lateral lines are reduced to one on each side, extending uninterrupted from the head to the root of the caudal fin, although among this order there is hardly a single large group that does not offer exceptions such as are shown in the *Cichlidæ*. In these, both upper and lower lateral lines may be complete; or the upper may be complete and the lower reduced, or the reverse; or the upper may be incomplete posteriorly and the lower anteriorly, which latter disposition has led to the misconception involved in the term "interrupted."

[1] Abbild. u. Beschr. n. Thier. Syrien, p. 235 (1843).

[2] Tr. R. Dublin Soc. (2) iii. 1888, p. 531.

[3] *L. c.* p. 532.

[4] 'Study of Fishes,' p. 200 (1880).

I. *Lake Nyassa* [1].

Cichlidæ.

1. *Paratilapia robusta* Gthr.
2. „ *afra* Gthr.
3. „ *modesta* Gthr.
4. „ *livingstonii* Gthr.
5. „ *intermedia* Gthr.
6. „ *dimidiata* Gthr.
7. „ *longiceps* Gthr.
8. *Corematodus shiranus* Blgr.
9. *Tilapia shirana* Blgr.
10. „ *mossambica* Ptrs.
11. „ *kirkii* Gthr.
12. „ *squamipinnis* Gthr.
13. „ *rendalli* Blgr.
14. „ *lateristriga* Gthr.
15. „ *subocularis* Gthr.
16. „ *johnstoni* Gthr.
17. „ *lethrinus* Gthr.
18. „ *tetrastigma* Gthr.
19. „ *callipterus* Gthr.
20. „ *williamsi* Gthr.
21. „ *aurata* Blgr.
22. *Docimodus johnstoni* Blgr.

Mastacembelidæ.

23. *Mastacembelus shiranus* Gthr.

Siluridæ.

24. *Bagrus meridionalis* Gthr.
25. *Anoplopterus platychir* Gthr.
26. *Synodontis zambesensis* Gthr.

Cyprinidæ.

27. *Labeo mesops* Gthr.
28. *Barbus trimaculatus* Ptrs.
29. *Barilius guentheri* Blgr.
30. *Engraulicypris pinguis* Gthr.
31. *Pelotrophus microlepis* Gthr.
32. „ *microcephalus* Gthr.

Characinidæ.

33. *Alestes imberi* Ptrs.

Cyprinodontidæ.

34. *Haplochilus johnstoni* Gthr.

Mormyridæ.

35. *Mormyrus discorhynchus* Ptrs.
36. „ *catostoma* Gthr.
37. *Mormyrops zambanenje* Ptrs.

II. *Lake Tanganyika* [2].

Serranidæ.

1. *Lates microlepis* Blgr.

Cichlidæ.

2. *Lamprologus fasciatus* Blgr.
3. „ *compressiceps* Blgr.
4. „ *moorii* Blgr.
5. „ *modestus* Blgr.
6. „ *elongatus* Blgr.
7. „ *furcifer* Blgr.
8. *Telmatochromis vittatus* Blgr.
9. *Telmatochromis temporalis* Blgr.
10. *Julidochromis ornatus* Blgr.
11. *Paratilapia pfefferi* Blgr.
12. „ *macrops* Blgr.
13. „ *ventralis* Blgr.
14. „ *furcifer* Blgr.
15. „ *leptosoma* Blgr.
16. *Ectodus descampsii* Blgr.
17. „ *melanogenys* Blgr.
18. *Bathybates ferox* Blgr.
19. *Eretmodus cyanostictus* Blgr.

[1] *Cf.* Günther, P. Z. S. 1864, p. 307, 1893, p. 616, and Ann. & Mag. N. H. (6) xvii. 1896, p. 397; Boulenger P. Z. S. 1896, p. 915, and Ann. & Mag. N. H. (6) xix. 1897, p. 155, and (7) i. 1898, p. 254.

[2] *Cf.* Günther, P. Z. S. 1893, p. 628.

CICHLIDÆ (*continued*).

20. *Tilapia tanganicæ* Gthr.
21. „ *burtoni* Gthr.
22. „ *labiata* Blgr.
23. *Tropheus moorii* Blgr.
24. *Simochromis diagramma* Gthr.
25. *Petrochromis polyodon* Blgr.
26. *Perissodus microlepis* Blgr.
27. *Plecodus paradoxus* Blgr.

MASTACEMBELIDÆ.

28. *Mastacembelus moorii* Blgr.
29. „ *tanganicæ* Gthr.
30. „ *ophidium* Gthr.

SILURIDÆ.

31. *Clarias anguillaris* L.
32. „ *liocephalus* Blgr.
33. *Anoplopterus platychir* Gthr.
34. *Auchenaspis biscutata* Geoffr.
35. *Synodontis multipunctatus* Blgr.
36. *Malapterurus electricus* Gm.

CYPRINIDÆ.

37. *Labeo*, sp.

CHARACINIDÆ.

38. *Alestes macrolepidotus* C. & V.
39. „ *macrophthalmus* Gthr.
40. *Hydrocyon forskalii* Cuv.

CYPRINODONTIDÆ.

41. *Haplochilus tanganicanus* Blgr.

POLYPTERIDÆ.

42. *Polypterus bichir* Geoffr. (?).

LEPIDOSIRENIDÆ.

43. *Protopterus annectens* Ow. ? [1].

III. *Lake Victoria Nyanza* [2].

CICHLIDÆ.

1. *Paratilapia longirostris* Hilg.
2. „ *cavifrons* Hilg.
3. „ *retrodens* Hilg.
4. *Tilapia nilotica* Cuv.
5. „ *nuchisquamulata* Hilg.
6. „ *sauvagii* Pfeff.
7. „ *obliquidens* Hilg.

MASTACEMBELIDÆ.

8. *Mastacembelus*, sp.

SILURIDÆ.

9. *Clarias*, sp.
10. *Synodontis afrofischeri* Hilg.

CYPRINIDÆ.

11. *Labeo forskalii* Rüpp.
12. *Labeo rueppellii* Pfeff.
13. *Barbus pagenstecheri* Fisch.
14. „ *trimaculatus* Ptrs.

CHARACINIDÆ.

15. *Alestes rueppellii* Gthr.

CYPRINODONTIDÆ.

16. *Fundulus tæniopygus* Hilg.

MORMYRIDÆ.

17. *Mormyrus oxyrhynchus* Geoffr.
18. „ *longibarbis* Hilg.

LEPIDOSIRENIDÆ.

19. *Protopterus annectens* Ow.

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[1] Reported from Lake Tanganyika by Sir H. H. Johnston, Brit. C. Afr. p. 362 (1897).

[2] Hilgendorf, Sitzb. Ges. naturf. Fr. Berl. 1888, p. 75; Pfeffer, Thierw. O.-Afr., Fische (1896); Günther, Ann. & Mag. N. H. (6) xvii. 1896, p. 397.

IV. *Lake Rudolf* [1].

Cichlidæ.

1. *Tilapia nilotica* Cuv.
2. „ *tristrami* Gthr.

Siluridæ.

3. *Synodontis schal* Bl. Schn.
4. „ *smithii* Gthr.

Cyprinidæ.

5. *Barbus*, sp.

Characinidæ.

6. *Citharinus geoffroyi* Cuv.
7. *Alestes rueppellii* Gthr.
8. *Distichodus rudolphi* Gthr.

Polypteridæ.

9. *Polypterus senegalus* Cuv.

The fishes of Lake Nyassa are, with two exceptions, specifically distinct from those of the Nile, as pointed out by Dr. Günther [2], while seven out of forty-three species represented in Lake Tanganyika occur both in the Nile and in the rivers flowing into the Atlantic. And as the *Mormyridæ*, which furnish the two species common to Nyassa and the Nile [3], have not yet been recorded from Tanganyika, while, with the exception of a small stream-Siluroid, not one of the species described from the former lake has been rediscovered in the latter, it follows that, although similar in general character, the fish-fauna of the two lakes shows no trace of community so far as specific forms are concerned, as might have been expected from the absence of direct communication between them.

Before concluding these prefatory remarks, I wish to express my thanks to Messrs. J. H. Gardiner and J. Green for their kind assistance in supplying me with sciagraphs of the new fishes, which, supplementing the skeletons prepared by Mr. Groenvold, have enabled me to add some notes on the osteological characters of the genera described as new.

Serranidæ.

1. Lates microlepis, sp. n. (Plate I. fig. 1.)

Body elongate, its depth $3\frac{1}{2}$ times in the total length. Length of head 3 times in total length; upper profile nearly straight; diameter of eye equal to length of snout, $3\frac{3}{4}$ times in length of head; lower jaw projecting; maxillary extending to below centre of eye, the width of its distal extremity not quite half diameter of eye; præ- and suborbitals finely serrated; cheeks, opercles, and occiput covered with small scales; præopercular border forming nearly a right angle, finely toothed on its vertical limb, with two or three widely-separated spines on its lower limb, and with one or two very

[1] Günther, P. Z. S. 1896, p. 217.

[2] 'Study of Fishes,' p. 230.

[3] If, as seems probable, the distinction between *Mormyrops zambanenje* and *M. anguilloides* should not be maintained. On the other hand, the Nilotic specimens referred to *Mormyrus discorhynchus* may prove to be specifically separable. Lake Tanganyika might thus ultimately possess no species of fish in common with the Nile.

strong spines at the angle; opercular spine as much developed as the latter; clavicle with a group of 3 or 4 strong spines. 16 gill-rakers on lower part of anterior arch. Dorsal VII, II 11; first and second spines short, third very strong, longest, $\frac{2}{3}$ length of head; longest soft rays $\frac{2}{5}$ length of head. Pectoral $\frac{1}{2}$ length of head. Anal III 8; spines short, second and third equal. Caudal truncate. Caudal peduncle twice as long as deep. Scales 100–110 $\frac{12-13}{29-30}$. Body silvery, spotted and marbled with brown; dorsals spotted with brown; caudal with irregular brown bars.

Total length 155 millim.

Two young specimens from Kinyamkolo.

This species is closely allied to the widely-distributed *Lates niloticus* Hasselq. Compared to young specimens of the latter, it differs in the smaller scales, the higher spinous dorsal, the longer caudal peduncle, and the shape of the caudal fin, which is truncate instead of rounded.

Cichlidæ.

2. Lamprologus fasciatus, sp. n. (Plate I. fig. 2.)

A few moderately large curved canine teeth in front of each jaw, followed by a narrow band of minute teeth; lateral teeth very small. Depth of body 4 times in total length, length of head 3. Snout as long as the diameter of the eye, which is 3 times in length of head and equals $1\frac{1}{2}$ interorbital width; maxillary extending to below anterior border of eye; cheeks naked; opercles and occiput scaled. Gill-rakers short, 12 on lower part of anterior arch. Dorsal XIX 8; spines increasing in length to the last, which measures $\frac{2}{5}$ length of head and nearly equals longest soft rays. Pectoral $\frac{1}{2}$ length of head. Ventral reaching vent. Anal X 6; spines increasing in length to the last, which slightly exceeds longest dorsal. Caudal rounded. Caudal peduncle as long as deep. Scales 46 $\frac{5}{10}$; lat. l. $\frac{24-26}{23-26}$. Yellowish, with 11 dark brown bars, the first across the vertex; fins greyish, dorsal and anal edged with blackish.

Total length 70 millim.

A single specimen from Kinyamkolo.

3. Lamprologus compressiceps, sp. n. (Plate I. fig. 3.)

A few moderately large curved canine teeth in front of each jaw, followed by a narrow band of minute teeth; lateral teeth very small, curved. Depth of body $2\frac{1}{2}$ to $2\frac{3}{5}$ times in total length, length of head $2\frac{3}{5}$ to $2\frac{3}{4}$. Head very strongly compressed, with concave upper profile; snout a little longer than diameter of eye, which is 4 times in length of head and equals $1\frac{1}{2}$ interorbital width; maxillary extending to below anterior border of eye; cheeks naked; opercles and occiput with small scales. Gill-rakers moderately long, 15 on lower part of anterior arch. Dorsal XX–XXI 6;

spines increasing in length to the sixth, which measures half length of head, the posterior a little shorter; longest soft rays a little longer than longest spines. Pectoral $\frac{1}{2}$ to $\frac{3}{5}$ length of head. Ventral produced into a filament. Anal X 5; spines increasing in length to the last, which equals the last dorsal; longest soft rays $\frac{3}{5}$ length of head. Caudal rounded. Caudal peduncle as long as deep. Scales 32–33 $\frac{5}{12}$; lat. l. $\frac{22-23}{9-10}$. Brown, with indistinct traces of five darker vertical bars; pectoral bright yellow, other fins blackish towards the border.

Total length 83 millim.

Two specimens from Kinyamkolo.

4. Lamprologus moorii, sp. n. (Plate I. fig. 4.)

9 or 10 equal, moderately large conical teeth in front of each jaw, followed by a narrow band of minute teeth; lateral teeth very small. Depth of body $2\frac{1}{2}$ times in total length, length of head 3 to $3\frac{1}{5}$. Snout as long as diameter of eye, which is 3 to $3\frac{1}{3}$ times in length of head and equals interorbital width; maxillary extending to below anterior border of eye; cheeks with small, deciduous scales; opercles and occiput scaled. Gill-rakers short, 9 or 10 on lower part of anterior arch. Dorsal XIX–XX 8–9; spines slightly increasing in length to the last, which measures nearly half length of head; middle soft rays prolonged, at least $\frac{3}{4}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head. Ventral prolonged into a long filament. Anal VII–VIII 6–7; spines increasing in length to the last, which is a little longer than the longest dorsal; middle soft rays prolonged into filaments. Caudal rounded. Caudal peduncle as long as deep. Scales 33–35 $\frac{5-7}{11-12}$; lat. l. $\frac{24-28}{9-13}$. Dark brown; fins blackish.

Total length 93 millim.

Several specimens from Mbity Rocks and Kinyamkolo.

5. Lamprologus modestus, sp. n. (Plate I. fig. 5.)

A few large curved canine teeth, tipped with brown, in front of each jaw, followed by a band of minute teeth; lateral teeth very small. Depth of body $3\frac{1}{3}$ to $3\frac{2}{5}$ times in total length, length of head 3 to $3\frac{1}{3}$. Snout a little longer than diameter of eye, which is $3\frac{1}{2}$ to 4 times in length of head and equals interorbital width; maxillary extending to below anterior border of eye; cheeks naked; opercles and occiput scaled. Gill-rakers very short, 7 on lower part of anterior arch. Dorsal XX 8–9; spines increasing in length to the last, which is not quite half length of head; middle soft rays prolonged, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Pectoral about $\frac{2}{3}$ length of head. Ventral prolonged into a short filament. Anal V 6–7; spines increasing in length to the last, which is as long as middle dorsals; middle soft rays prolonged, like the dorsals. Caudal truncate. Caudal peduncle as long as deep. Scales 36–40 $\frac{5-6}{12-14}$; lat. l. $\frac{24-25}{7-11}$.

Uniform brown; soft dorsal and caudal fins with round black spots between the rays.

Total length 75 millim.

A single specimen from Mbity Rocks, and another from Kinyamkolo.

6. Lamprologus elongatus, sp. n. (Plate I. fig. 6.)

6 to 8 large canine teeth in front of each jaw, followed by a broad band of minute villiform teeth; lateral teeth very small. Depth of body 4 times in total length, length of head $2\frac{3}{4}$ to $2\frac{4}{5}$. Snout twice as long as diameter of eye, which is 5 times in length of head and equals interorbital width; maxillary extending to below anterior border of eye; cheeks naked; opercles and occiput scaled. Gill-rakers moderately long, 12 on lower part of anterior arch. Dorsal XVIII 10–11; spines slightly increasing in length to the last, which measures $\frac{1}{3}$ length of head; longest soft rays half length of head. Pectoral half length of head. Ventral reaching vent. Anal V 8; spines increasing in length to the last, which equals longest dorsal. Caudal truncate. Caudal peduncle $1\frac{1}{2}$ as long as deep. Scales 90–95 $\frac{10}{22-28}$; lat. l. $\frac{44-56}{20-30}$. Brown, with darker spots having a tendency to form cross-bars; caudal fin with round dark spots between the rays.

Total length 113 millim.

One specimen from Mbity Rocks, and one from Kinyamkolo.

7. Lamprologus furcifer, sp. n. (Plate II. fig. 1.)

A few large curved canine teeth in front of each jaw, followed by a moderately broad band of minute villiform teeth; lateral teeth very small. Depth of body 4 to $4\frac{1}{4}$ times in total length, length of head $2\frac{4}{5}$ to 3. Snout as long as or a little longer than diameter of eye, which is $3\frac{1}{2}$ to $3\frac{2}{3}$ times in length of head and exceeds interorbital width; maxillary extending to below anterior fourth of eye; cheeks and opercles with deciduous scales. Gill-rakers short, 16 on lower part of anterior arch. Dorsal XX–XXI 7–8; spines increasing in length to the last, which measures $\frac{2}{5}$ length of head; middle soft rays produced, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Pectoral $\frac{3}{4}$ length of head. Ventral reaching vent or origin of anal. Anal VI–VII 6; spines increasing in length, the last nearly as long as last dorsal; middle soft rays produced. Caudal deeply notched, crescentic. Caudal peduncle $1\frac{1}{2}$ as long as deep. Scales 50–54 $\frac{6-7}{16-17}$; lat. l. $\frac{32-34}{22-31}$; lower lateral line often nearly complete. Dark brown, with very indistinct blackish bars on the body; dorsal and caudal with round black spots between the rays; tips of the caudal lobes whitish.

Total length 125 millim.

Three specimens from Kinyamkolo, and one from Mbity Rocks.

The genus *Lamprologus* was known from a single species *L. congoensis* Schilthuis, discovered a few years ago in the Congo. The species now described raise the number to 7, distinguishable by means of the following key:—

I. Caudal rounded or truncate.

A. Anal with 10 spines.

D. XIX 8; Sc. 46 $\frac{5}{10}$; depth of body 4 times in total length . . . . . 1. *L. fasciatus.*

D. XX–XXI 6; Sc. 32–33 $\frac{5}{12}$; depth of body $2\frac{3}{5}$ to $2\frac{3}{4}$ times in total length. 2. *L. compressiceps.*

B. Anal with 6 to 8 spines.

D. XIX–XX 8–9; Sc. 33–35 $\frac{5-7}{11-12}$; depth of body $2\frac{1}{2}$ times in total length . 3. *L. moorii.*

D. XVIII–XIX 8–10; Sc. 42–53 $\frac{6-7}{14-15}$; depth of body $3\frac{3}{4}$ to 4 times in total length. 4. *L. congoensis.*

C. Anal with 5 spines.

D. XX 8–9; Sc. 36–40 $\frac{5-6}{11-14}$; depth of body $3\frac{1}{3}$ to $3\frac{2}{5}$ times in total length . 5. *L. modestus.*

D. XVIII 10–11; Sc. 90–95 $\frac{16}{22-28}$; depth of body 4 times in total length . 6. *L. elongatus.*

II. Caudal deeply notched, crescentic.

D. XX–XXI 7–8; A. VI–VII 6; Sc. 50–54 $\frac{6-7}{16-17}$ . . . . . 7. *L. furcifer.*

Telmatochromis, g. n.

Body more or less elongate; scales ctenoid. Jaws with a series of conical teeth, followed by a broad band of minute tricuspid teeth; lateral teeth small, conical. Maxillary exposed. Dorsal with 20 to 22 spines, anal with 6 or 7. Vertebræ 33 (16+17).

This genus is closely allied to *Lamprologus*, differing in the small teeth forming a band behind the outer row being tricuspid instead of conical. It therefore stands somewhat in the same relation to *Lamprologus* as *Tilapia* does to *Paratilapia*.

8. Telmatochromis vittatus, sp. n. (Plate II. fig. 2.)

12 to 16 enlarged conical teeth, tipped with brown, in the outer row in each jaw. Depth of body $4\frac{1}{2}$ to $4\frac{2}{3}$ times in total length, length of head 4. Snout descending in a strong curve, as long as or a little longer than the diameter of the eye, which is $3\frac{2}{3}$ to 4 times in length of head and equals interorbital width; maxillary extending to below the nostril; head naked, opercle with a few deciduous scales. Gill-rakers very short and few. Dorsal XXI–XXII 8; spines increasing in length to the last, which equals $\frac{1}{2}$ length of head; soft rays a little longer. Pectoral $\frac{3}{4}$ length of head. Ventral produced into a short filament, reaching origin of anal. Anal VII 5–6; spines increasing in length to the last, which equals last dorsal. Caudal rounded. Caudal peduncle as long as deep. Scales 45–52 $\frac{6}{16}$; lat. l. $\frac{25-29}{13-15}$. Yellowish, with a dark

brown lateral stripe from the upper lip, through the eye, to the base of the caudal, where it expands into a spot; another dark brown stripe from the vertex along the base of the dorsal; a few brown spots on the dorsal; anal edged with dark brown; a black bar at the base of the pectoral, which is white.

Total length 78 millim.

Two specimens from Mbity Rocks.

9. Telmatochromis temporalis, sp. n. (Plate II. fig. 3.)

8 to 12 enlarged conical teeth, tipped with brown, in the outer row in each jaw. Depth of body $3\frac{1}{4}$ to $3\frac{1}{2}$ times in total length; length of head 3 to $3\frac{1}{4}$. Snout descending in a strong curve, $1\frac{1}{2}$ as long as the diameter of the eye, which is $4\frac{1}{2}$ times in length of head and a little less than interorbital width; maxillary extending to below anterior border of eye; head naked, or with a few deciduous scales on the opercles. Gill-rakers very short and few. Dorsal XX–XXI 6–7; spines increasing in length to the last, which equals $\frac{1}{3}$ to $\frac{1}{2}$ length of head; middle soft rays produced, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Pectoral $\frac{2}{3}$ length of head. Ventral produced into a filament, extending beyond origin of anal. Anal VI–VII 6–7; spines increasing in length to the last, which equals or slightly exceeds last dorsal; soft rays produced, like the dorsals. Caudal rounded. Caudal peduncle as long as deep. Scales 43–46 $\frac{6}{12}$; lat. l. $\frac{25}{9-17}$. Brown, with small round darker spots between the dorsal, anal, and caudal rays; a dark horizontal streak behind the eye; a dark bar at base of pectoral.

Total length 85 millim.

Three specimens from Kinyamkolo, and one from Mbity Rocks.

The deep anterior groove of the skull, in which the ascending processes of the præmaxillaries are received, extends to the anterior third of the orbits, and the strong occipital crest is prolonged forward to it; parietal crests are entirely absent; the chain of suborbital bones is very slender. None of the ribs are sessile, being inserted on a step at the back of the transverse processes of the vertebræ at a short distance from the centre; all bear epipleurals; only the last præcaudal vertebra has a hæmal bridge.

Julidochromis, g. n.

Body elongate; scales ctenoid. Jaws very narrow, with a few curved canines in front, the outer of which are very large and tusk-like, followed on the sides and behind by minute conical teeth forming a narrow band. Maxillary exposed. Dorsal with 22 to 24 spines, anal with 8 or 9. Vertebræ 34 (17+17).

This genus represents an exaggerated type of *Lamprologus*. The very specialized dentition and the general aspect remind one of the Julidine *Labridæ*, whence the name proposed.

10. Julidochromis ornatus, sp. n. (Plate II. fig. 4.)

4 or 6 canines in each jaw, tipped with brown. Depth of body 4 to $4\frac{1}{2}$ times in total length, length of head $3\frac{1}{3}$ to $3\frac{1}{2}$. Snout $1\frac{1}{2}$ to twice as long as diameter of eye, which is $4\frac{1}{2}$ to 5 times in length of head and $1\frac{1}{2}$ in interorbital width; maxillary extending to below nostril; cheeks naked; opercles scaled. Gill-rakers very short and few. Dorsal XXII–XXIV 5; spines equal from the eighth or tenth, $\frac{1}{3}$ length of head; longest soft rays $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Pectoral about $\frac{2}{3}$ length of head. Ventral produced in a filament, reaching origin of anal. Anal VIII–IX 4–6; spines increasing in length to the last, which equals $\frac{2}{5}$ length of head. Caudal rounded. Caudal peduncle as long as deep. Scales 45-50 $\frac{6-7}{12-13}$; lat. l. $\frac{26-29}{10-15}$. Yellowish, with three dark brown stripes on each side, the lower from the end of the snout to the base of the caudal, the upper along the base of the dorsal; a large round dark-brown spot on the base of the caudal; a small black spot at the base of the pectoral; anal edged with brown; caudal brown.

Total length 85 millim.

Five specimens from Mbity Rocks.

The præmaxillary groove is deep and extends to the anterior third of the orbits; the occipital crest is low and continued forward to the præmaxillary groove; parietal crests are present, but very feeble; the chain of suborbital bones is replaced by a ligament; the mandible is very massive, the lower surface flat, projecting as a keel on the sides. The ribs are inserted on a step of the transverse processes, at a short distance from the centre; all bear epipleurals; only the last præcaudal vertebra has a hæmal bridge.

11. Paratilapia pfefferi, sp. n. (Plate III. fig. 1.)

Teeth small, in 3 series in each jaw, forming a narrow band, outer largest. Depth of body equal to length of head, $2\frac{2}{3}$ times in total length. Snout with straight upper profile, as long as eye, the diameter of which is $3\frac{1}{3}$ times in length of head and equals $1\frac{1}{2}$ interorbital width; maxillary extending to below anterior border of eye; 3 series of scales on the cheek; large scales on the opercle. Gill-rakers rather long, 11 on lower part of anterior arch, the larger spatulate. Dorsal XVI 8; spines increasing in length to the sixth, which measures a little less than $\frac{1}{2}$ length of head and nearly equals longest soft rays. Pectoral $\frac{4}{5}$ length of head. Ventral reaching origin of anal. Anal III 7; third spine longest, as long as longest dorsal. Caudal feebly emarginate. Caudal peduncle $1\frac{1}{2}$ as long as deep. Scales very finely denticulate on the edge, $33\frac{3}{9}$; lat. l. $\frac{21-22}{12-13}$. Pale olive above, silvery beneath, with seven darker vertical bars; fins greyish brown.

Total length 76 millim.

A single specimen from Kinyamkolo.

This species, which I have much pleasure in naming after the distinguished zoologist of Hamburg, Dr. G. Pfeffer, who has much contributed to our knowledge of East African ichthyology, is nearest allied to *P. intermedia* Gthr., from Nyassa.

12. Paratilapia macrops, sp. n. (Plate III. fig. 2.)

Teeth small, in 3 series in each jaw, forming a narrow band, outer largest. Depth of body three times in total length; length of head $2\frac{2}{3}$ to 3. Snout with straight upper profile, a little shorter than the eye, the diameter of which is $2\frac{3}{4}$ times in length of head and exceeds interorbital width; maxillary extending to below anterior border of eye; 2 or 3 series of scales on the cheek; large scales on the opercle. Gill-rakers short, 11 on lower part of anterior arch. Dorsal XVI 10–12; spines increasing in length to the sixth, which measures a little less than $\frac{1}{2}$ length of head and equals longest soft rays. Pectoral as long as head. Ventral extending a little beyond origin of anal. Anal III 6–7; third spine longest, a little shorter than longest dorsal. Caudal with crescentic emargination. Caudal peduncle as long as deep. Scales very finely denticulate on the edge, 33–34 $\frac{3}{10}$; lat. l. $\frac{33}{15-17}$; upper lateral line complete, extending to base of caudal. Pale brownish above, silvery beneath; a series of five indistinct dark blotches on each side of the body; spinous dorsal edged with brown above.

Total length 70 millim.

Two specimens from Kinyamkolo, and one from Mbity Rocks.

Closely allied to the preceding species; distinguished by the larger eye, the complete upper lateral line, the longer pectoral, and the more strongly emarginate caudal. Connects the preceding species with the following, which represents a more aberrant type.

13. Paratilapia ventralis, sp. n. (Plate III. fig. 3.)

Teeth very small, in 2 series in both jaws, the outer larger and tipped with brown. Depth of body $2\frac{2}{3}$ to 3 times in total length, length of head 3. Snout with curved upper profile, a little shorter than the eye, the diameter of which is $2\frac{2}{3}$ to $2\frac{3}{4}$ times in length of head and exceeds interorbital width; maxillary extending to below anterior fourth of eye; 2 or 3 series of scales on the cheek; large scales on the opercle. Gill-rakers rather long, lanceolate, 17 to 19 on lower part of anterior arch. Dorsal XII–XIII 13–14; spines increasing in length to the eighth or ninth, which measures nearly $\frac{1}{2}$ length of head and $\frac{3}{4}$ or $\frac{4}{5}$ longest soft rays. Pectoral a little longer than head. Ventral much produced, extending far beyond the origin of the anal, especially in the males, in which it may reach the end of the caudal. Anal III 9–10; third spine longest, about $\frac{2}{5}$ length of head; middle soft rays produced, nearly as long as head. Caudal deeply emarginate, crescentic. Caudal peduncle $1\frac{1}{2}$ as long as deep.

Scales finely denticulate on the edge, 34–36 $\frac{4}{13-14}$; lat. l. $\frac{30-36}{10-16}$; upper lateral line complete or nearly so, usually reaching base of caudal. Grey-brown above, with or without irregular darker spots, silvery below; fins grey-brown, the ends of the ventral filaments white.

Total length 92 millim.

8 specimens from Kinyamkolo, and one from Mbity Rocks.

This species is remarkable among its congeners from continental Africa for the low number of its dorsal spines combined with the large eye, the crescentic caudal, the extremely produced ventrals, and the upper lateral line extending on the caudal peduncle.

14. Paratilapia furcifer, sp. n. (Plate IV. fig. 1.)

Teeth very small, in 3 series in both jaws, the outer largest and tipped with brown. Depth of body equal to length of head, 3 times in total length. Snout with curved upper profile, a little shorter than the eye, the diameter of which is $2\frac{2}{3}$ to $2\frac{3}{4}$ times in length of head and slightly exceeds interorbital width; maxillary extending to below anterior border of eye; 2 or 3 series of scales on the cheek; large scales on the opercle. Gill-rakers rather long, lanceolate, 15 or 16 on lower part of anterior arch. Dorsal XIII 13–14; spines increasing in length to the ninth, which measures a little less than $\frac{1}{2}$ length of head; some of the soft rays produced, nearly as long as head. Pectoral a little longer than head. Ventral much produced, extending nearly to caudal. Anal III 9; third spine longest, $\frac{2}{5}$ length of head; middle soft rays produced, like the dorsals. Caudal deeply emarginate, crescentic, the rays at the angles produced. Caudal peduncle $1\frac{1}{2}$ as long as deep. Scales finely denticulate on the edge, 60–63 $\frac{4-5}{16-17}$; lat. l. $\frac{54-55}{28-32}$; upper lateral line nearly complete, extending on the caudal peduncle. Bluish above, white beneath; a few ill-defined yellow streaks along the body; some yellow marblings on the postocular part of the head; fins white, with some yellow streaks on the dorsal and anal and between the ventral and caudal rays (according to a sketch by Mr. Moore).

Total length 110 millim.

Two specimens from Kinyamkolo.

Closely allied to the preceding; distinguished by much smaller scales.

15. Paratilapia leptosoma, sp. n. (Plate III. fig. 4.)

Teeth small, in 3 series in the upper jaw, in 4 in the lower, outer largest. Depth of body 4 to $4\frac{1}{3}$ times in total length; length of head 3. Snout with straight upper profile, as long as or a little longer than the eye, the diameter of which is $3\frac{1}{2}$ to $3\frac{2}{3}$ times in length of head, and equals interorbital width; maxillary extending to below anterior border of eye or not quite so far; 2 series of scales on the cheek; opercle

covered with scales. Gill-rakers long, slender, and close-set, 20 on lower part of anterior arch. Dorsal XII 14–15; spines increasing in length to the last, which measures $\frac{2}{5}$ length of head, and is nearly as long as the soft rays. Pectoral $\frac{3}{4}$ length of head. Ventral reaching origin of anal. Anal III 10–12; third spine longest, a little shorter than longest dorsal. Caudal feebly emarginate. Caudal peduncle twice as long as deep. Scales very finely denticulate on the edge, 39–40 $\frac{2-3}{11}$; lat. l. $\frac{27-31}{11-13}$. Brown, lighter beneath; dorsal and anal with or without brown longitudinal streaks; caudal spotted with brown or black at the base.

Total length 87 millim.

Two specimens from Kinyamkolo, and two from Mbity Rocks.

Approaches *P. longiceps* Gthr. in the elongate body, but differs greatly in the dentition, the shape of the snout, and the fin-formula. Only the Malagassy species of the genus *Paratilapia* were known to have fewer than 13 spines in the dorsal fin; but one of the species described above (*P. ventralis*) has only 12 or 13.

Bathybates, g. n.

Body elongate; scales cycloid, small and irregular. Several rows of large fang-like teeth in the jaws. Maxillary exposed. Dorsal with 14 spines, anal with 3. Vertebræ 36 (17+19).

This genus is closely related to *Paratilapia*, with which it is to a certain extent connected by *P. longiceps* Gthr., from Nyassa. However, the more formidable dentition, coupled with the character of the scales on the body, appear sufficient to warrant the establishment of a new genus. The unique species appears in most respects more specialized than *Paratilapia longiceps*, although more primitive than any known species of that genus in the longer anal fin and the complete upper lateral line.

16. Bathybates ferox, sp. n. (Plate IV. fig. 2.)

Teeth long and sharp, fang-like, wide apart, in 4 series in the upper jaw, in 3 in the lower. Depth of body 4 times in total length, length of head 3 times. Snout long and strongly compressed, with convex upper profile; eye large, its diameter $1\frac{2}{5}$ times in length of snout, $3\frac{1}{2}$ in length of head, and a little greater than interorbital width; maxillary not quite reaching to below anterior border of eye; 5 series of small scales on the cheek; large scales on the opercle. Gill-rakers moderately long and slender, 13 on lower part of anterior arch. Dorsal XIV 16; spines rather feeble, slender, subequal from the fifth, which measures $\frac{2}{7}$ length of head; longest soft rays $\frac{1}{3}$ length of head. Pectoral $\frac{3}{4}$ length of head. Ventral not reaching vent. Anal III 16; spines short and feeble. Caudal deeply forked, middle rays not half as long as outer. Caudal peduncle nearly twice as long as deep. Scales small and irregular,

especially below the lateral lines, 78 $\frac{7}{38}$; lat. l. $\frac{78}{44}$; the upper extending from the opercle to the caudal, the lower from below the last dorsal spines to the caudal. Pale bluish green, iridescent above, white below; dorsal and anal bluish grey; ventrals and caudal yellowish; pectorals yellow; two dark streaks on the dorsal.

Total length 275 millim.

A single specimen from Kinyamkolo, taken at a depth of 400 feet. The specimen is a female with ripe ova; these are of large size, measuring $3\frac{1}{2}$ millim. in diameter. The stomach contains a small, partially-digested fish of the genus *Paratilapia*, as first ascertained by a sciagraph kindly prepared by Messrs. Gardiner and Green, which has enabled me to compare the structure of the vertebral column with that of other members of the family *Cichlidæ*. The insertion of the ribs is typical, viz., sessile, except on the last three præcaudal vertebræ; the transverse processes are short and in front of the ribs. The number of vertebræ agrees with that of the more elongate species of *Paratilapia*.

ERETMODUS, g. n.

Body moderately elongate; scales ctenoid. Jaws with rather large spatulate teeth with truncated crowns disposed in oblique transverse rows of two or three. Lips much developed; maxillary entirely concealed when the mouth is closed. Dorsal with 23 to 25 spines; soft rays reduced to 3 to 5; anal with 3 spines. Vertebræ 30 (15+15).

A strongly aberrant form, remarkable for its dentition and the structure of the dorsal, formed almost entirely of spines.

17. ERETMODUS CYANOSTICTUS, sp. n. (Plate III. fig. 5.)

8 or 10 transverse series of teeth in each jaw, the crowns reddish brown. Depth of body equal to length of head, 3 times in total length. Profile of snout curved; length of snout $1\frac{1}{2}$ to twice diameter of eye, which is $4\frac{1}{3}$ to 5 times in length of head, and a little less than interorbital width; mouth extending to below nostril; cheeks and opercles naked. Gill-rakers short, 9 or 10 on lower part of anterior arch. Dorsal XXIII–XXV 3–5; spines subequal from the sixth, $\frac{1}{3}$ length of head, a little shorter than soft rays. Pectoral $\frac{3}{4}$ length of head. Ventral reaching vent. Anal III 6–7; third spine longest, a little longer than dorsals; soft rays about $\frac{2}{3}$ length of head. Caudal rounded. Caudal peduncle deeper than long. Scales 32–35 $\frac{3}{11-12}$; lat. l. $\frac{22-23}{6-9}$. Blackish brown, with scattered pale blue dots; belly yellowish.

Total length 75 millim.

Five specimens from Mbity Rocks, and three from Kinyamkolo.

The toothed portions of the præmaxillary and mandible are much developed in depth, in a manner suggestive of the *Sparidæ* and *Scaridæ*, and the teeth are implanted in sockets. The deep triangular groove for the reception of the præmaxillaries extends

to between the orbits, and the occipital crest is prolonged to it; the parietal crests are produced on the frontals; the præorbital is large, and the chain of suborbitals very slender. The pharyngeal teeth have long slender shafts and conical brown cusps. The ribs are attached to the back of short transverse processes; all but the last one support epipleurals; the last four præcaudal vertebræ have a hæmal bridge.

18. Tilapia labiata, sp. n. (Plate V. fig. 1.)

Outer teeth rather large, feebly notched; inner teeth very small, tricuspid, in 3 or 4 series. Depth of body equal to length of head, $2\frac{2}{3}$ to $2\frac{3}{4}$ times in total length. Snout with straight upper profile, $1\frac{1}{4}$ to $1\frac{3}{4}$ diameter of eye, which is $3\frac{1}{2}$ to $4\frac{1}{2}$ times in length of head and equals interorbital width; maxillary not extending to below anterior border of eye; 3 or 4 series of scales on the cheek; large scales on the opercle; lips very strongly developed, both produced into a large triangular lobe in front. Gill-rakers moderate, 15 on lower part of anterior arch. Dorsal XVIII 10; middle dorsal spines longest, about $\frac{2}{5}$ length of head, and a little shorter than longest soft rays. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head. Ventral reaching origin of anal. Anal III 6–7; third spine longest, as long as longest dorsals, slightly shorter than longest soft rays. Caudal truncate. Caudal peduncle slightly longer than deep. Scales finely denticulate on the border, 33–35 $\frac{5-6}{12-13}$; lat. l. $\frac{22-25}{13-15}$. Pale olive, with 10 more or less distinct darker cross-bars; fins greyish-brown; dorsal sometimes with oblique dark and light streaks; caudal with numerous round dark spots between the rays.

Total length 170 millim.

Four specimens from Kinyamkolo.

This species is easily recognizable by the extraordinary development of the lips, which bears a curious resemblance to that observed in the Central American *Heros labiatus*[1]. It appears to be nearest allied to *Ctenochromis nuchisquamulatus* Hilg., and *C. sauvagii* Pfeffer, from the Victoria Nyanza.

Tropheus, g. n.

Body moderately elongate; scales ctenoid. Jaws angularly bent at the sides, with bands of minute tricuspid teeth, an outer row of bicuspid teeth, and enlarged conical teeth at the sides of the præmaxillary; mouth transversely linear when closed; maxillary concealed under the præorbital. Dorsal with 21 spines, anal with 6. Vertebræ 33 (17+16).

This genus differs from *Tilapia* in the angularly-broken præmaxilla armed with enlarged conical teeth at the sides, and the higher number of anal spines.

The name proposed (τροφεύς, one who rears, brings up, educates) refers to the peculiar mode of nursing the eggs described hereafter.

[1] Günther, P. Z. S. 1864, pl. iv. fig. 1.

19. Tropheus moorii, sp. n. (Plate V. fig. 2.)

Teeth minute, those of the outer series tipped with brown and numbering about 50. Depth of body $2\frac{1}{2}$ to $2\frac{2}{3}$ times in total length, length of head $3\frac{1}{4}$ to $3\frac{1}{2}$. Snout descending in a strong curve, as long as or a little longer than the diameter of the eye, which is $3\frac{1}{2}$ to 4 times in length of head, and equals $\frac{2}{3}$ to $\frac{3}{4}$ interorbital width; mouth extending to below anterior border of eye; 4 series of scales on the cheek; large scales on the opercle. Gill-rakers short, 11 or 12 on lower part of anterior arch. Dorsal XXI 5–6; spines increasing in length to the sixth, which measures not quite half length of head; longest soft rays $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Pectoral as long as head. Ventral produced into a short filament, reaching beyond origin of anal. Anal VI 5–6; spines increasing in length to the last, which slightly exceeds longest dorsal. Caudal slightly notched. Caudal peduncle as long as deep. Scales 30–32 $\frac{3}{12}$; lat. l. $\frac{22\text{–}25}{11\text{–}12}$. Dark brown; a large bluish-white blotch on each side; belly reddish brown; fins blackish.

Total length 110 millim.

Five specimens from Kinyamkolo.

The occipital crest is very strong and the parietal crests are produced on the frontals. The insertion of the ribs is as described in the preceding genera *Telmatochromis* and *Eretmodus*.

The mouth and pharynx of one of the specimens contains four eggs of very large size, the vitelline sphere measuring 4 millimetres in diameter, with an embryo in an advanced stage of development. The egg of the Fifteen-spined Stickleback (*Gasterosteus spinachia*), hitherto regarded as the largest Teleostean egg in proportion to the size of the animal, measures only 3 millimetres in diameter[1]. Besides the Siluroids of the genera *Arius* and *Galeichthys*, which have very large eggs, at least two species of *Tilapia* were known to give shelter to their eggs in the manner noticed above, viz., *T. simonis* Gthr. (*Chromis paterfamilias* Lortet), as observed by Prof. Lortet in Lake Tiberias, and *T. nilotica* Cuv., as noticed by me in a specimen collected by Canon Tristram in the same lake. But these eggs, produced by fishes of the size of our common Perch, are very numerous, and measure only about 2 millim. in diameter. It has besides been observed in these *Tilapiæ*, as well as in the Siluroids, that the function of protecting the eggs devolves on the male sex, while, to my surprise, the Tanganyika fish proved on autopsy to be a female. Whether this is constantly so, or whether either parent takes to the nursing duties, remains to be ascertained by examination of a larger number of specimens. I am all the more disposed to think the latter possibility will be confirmed, from the fact that a specimen of *Tilapia nilotica*

[1] The absolutely largest known Teleostean egg is that of the Siluroid *Arius commersonii*, which measures 17 millim. in diameter. The size of the *Arius*-egg is much underrated by Günther ('Study of Fishes,' p. 160) and by McIntosh and Masterman ('British Marine Food Fishes,' p. 12), who ascribe to it a maximum of 10 millim

with the pharynx filled with embryos belongs to the female sex, while Dr. Lortet's observations on *T. simonis* had led to the belief that specimens carrying eggs in that manner are invariably males.

It is here necessary to recall the observation contained in Livingstone's 'Last Journals,' vol. ii. p. 17, that the "Dagala" or "Nsipé," of Lake Tanganyika, a small fish 2 or 3 inches long, and very like Whitebait, is said to emit eggs by the mouth. The comparison of this fish to Whitebait excludes the possibility of the one here described being the "Dagala" or "Nsipé," which will probably prove to be a Cyprinodont, if not actually the *Haplochilus tanganicanus* described below.

Simochromis, g. n.

Body moderately elongate; scales ctenoid. Jaws with broad bands of minute tricuspid teeth, with an outer series of larger bicuspid teeth, and a single series of conical teeth at the sides of the præmaxillary; maxillary concealed under the præorbital. Dorsal with 17 or 18 spines, anal with 3. Vertebræ 31–32 (15+16–17).

The type species differs from the other members of the genus to which it was originally referred in the differentiation of the teeth at the sides of the præmaxillary, a character in which it agrees with the genus *Tropheus*.

20. Simochromis diagramma Gthr.

Chromis diagramma Günth. Proc. Zool. Soc. 1893, p. 632, pl. lviii. fig. 3.

The bands of teeth in both jaws consisting of 8 to 10 series, gradually decreasing in size from the outer border. Depth of body $2\frac{1}{2}$ to $2\frac{2}{3}$ times in total length, length of head $3\frac{1}{4}$ to $3\frac{1}{2}$. Snout descending in a strong curve; diameter of eye 3 to $3\frac{1}{2}$ times in length of head, $1\frac{1}{2}$ in interorbital width; mouth extending to below anterior border of eye; 4 series of scales on the cheek; large scales on the opercle. Gill-rakers short, 12 or 13 on lower part of anterior arch. Dorsal XVII–XVIII 9–10; spines increasing in length to the sixth, which measures $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft rays about $\frac{2}{3}$ length of head. Pectoral as long as head. Ventral reaching vent or origin of anal. Anal III 7–8; third spine longest, as long as longest dorsal. Caudal truncate. Caudal peduncle as long as deep. Scales 31–33 $\frac{3}{10}$; lat. l. $\frac{20-23}{10-14}$. Olive, whitish beneath; young with 9 rather indistinct vertical bars; gill-membrane sometimes with dark brown spots; fins greyish; a dark brown stripe may be present along the spinous dorsal, which has a black edge.

Total length 105 millim.

Four specimens from Kinyamkolo.

PETROCHROMIS, g. n.

Body moderately elongate; scales ctenoid. Jaws with very broad bands of minute, bristle-like teeth, with incurved bi- or tricuspid crowns; maxillary concealed under the præorbital. Dorsal with 17 or 18 spines, anal with 3. Vertebræ 32 (16+16).

Distinguished from *Tilapia* by the very broad bands of minute teeth with incurved crowns, from *Simochromis* by the absence of conical teeth in the præmaxillary.

21. PETROCHROMIS POLYODON, sp. n. (Plate VI. fig. 1.)

Crowns of teeth brown. Depth of body $2\frac{1}{2}$ to $2\frac{2}{3}$ times in total length, length of head $2\frac{3}{4}$ to 3 times. Snout with convex upper profile, $1\frac{1}{2}$ to $1\frac{2}{3}$ diameter of eye, which is 4 to $4\frac{1}{2}$ times in length of head and $1\frac{1}{2}$ in interorbital width; mouth hardly extending to below anterior border of eye; 4 or 5 series of scales on the cheek; large scales on the opercle. Gill-rakers very short, 12 or 13 on lower part of anterior arch. Dorsal XVII–XVIII 8–9; spines increasing in length to the sixth or seventh, which measures about $\frac{2}{5}$ length of head; longest soft rays $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Pectoral nearly as long as head. Ventral reaching vent or origin of anal. Anal III 7–8; third spine longest, as long as longest dorsal. Caudal truncate. Caudal peduncle as long as deep. Scales 32–34 $\frac{3-4}{12-13}$; lat. l. $\frac{22-24}{13-17}$. Olive-brown, whitish beneath; fins grey or blackish.

Total length 135 millim.

Two specimens from Kinyamkolo, and two from Mbity Rocks.

The præmaxillary and mandibular bones are very massive, and the maxillary is much reduced in size; the ascending processes of the præmaxillaries extend to between the anterior borders of the orbits and are received in a deep excavation, to which the strong occipital crest extends; the parietal crests are produced forwards as far as the frontals; the præorbital is large, and the chain of suborbitals very slender. Only the first rib is absolutely sessile, the following being attached to the back of the transverse processes at a short distance from the centre; the epipleurals extend to the twelfth rib; the last two præcaudal vertebræ form a hæmal bridge.

PERISSODUS, g. n.

Body elongate; scales cycloid. Teeth rather large, unequal in size, few, with swollen bases and low slightly-notched crowns, compressed transversely to the axis of the jaws, disposed in a single series; maxillary exposed. Dorsal with 18 spines, anal witb 3. Vertebræ 35 (17+18).

The extraordinary dentition which characterizes this new genus may be looked upon as an extreme specialization of that exhibited by *Tilapia*, a specialization in an opposite direction from that attained by *Petrochromis*.

22. Perissodus microlepis, sp. n. (Plate VI. fig. 2.)

10 teeth on each side of the præmaxillary, 9 on each side of the mandible. Depth of body $3\frac{2}{3}$ times in total length, length of head $3\frac{1}{4}$. Snout a little longer than diameter of eye, which is 4 times in length of head, and almost equals interorbital width; lower jaw projecting; maxillary extending to below anterior border of eye; 3 series of scales on the cheek; large scales on the opercle. Gill-rakers rather long, 14 on lower part of anterior arch. Dorsal XVIII 10; spines increasing in length to the last, which measures $\frac{2}{5}$ length of head; longest soft rays $\frac{2}{3}$ length of head. Pectoral $\frac{3}{4}$ length of head. Ventral not reaching vent. Anal III 8; third spine longest, nearly as long as longest dorsal; longest soft rays half length of head. Caudal truncate. Caudal peduncle $1\frac{1}{2}$ as long as deep. Scales 65 $\frac{5}{20}$; lat. l. $\frac{44}{30\text{-}31}$. Uniform dark reddish brown; a blackish opercular spot.

Total length 100 millim.

A single specimen from Mbity Rocks [1].

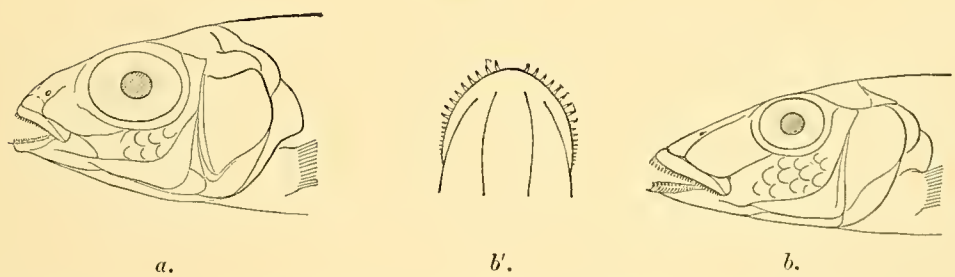
[1] I think it desirable to allude here briefly to two remarkable genera of *Cichlidæ* from Lake Tanganyika, which I have founded on specimens obtained by Capt. Descamps and sent to me for study by the Administration of the Congo Free State. The specimens are in so bad a condition that it will never be possible to draw up from them complete definitions of the species, but their dentitions, which indicate remarkable new genera, are well preserved, and I am sure the annexed figures together with the short notes here given will be sufficient to ensure their future recognition:—

Ectodus, g. n.—Teeth very small, conical, in two series in both jaws, the outer larger; outer mandibular teeth pointing outward, perpendicular to the others; maxillary concealed under the præorbital when the mouth is closed. Scales rather large, ctenoid. Dorsal with 14 spines, anal with 3.

Ectodus descampsi, sp. n. (Fig. 1, *a*.)—D. XIV 14; A. III 8. Depth of body $3\frac{4}{5}$ times in total length, length of head 3. Eye very large, $2\frac{4}{5}$ in length of head, $1\frac{3}{4}$ interorbital width. Two series of scales on the cheek. Sc. 34 $\frac{3}{10}$; lat. l. $\frac{28}{15}$. Total length 95 millim.

Ectodus melanogenys, sp. n. (Fig. 1, *b*.)—D. XIV 16; A. III 13. Depth of body 5 times in total length, length of head $3\frac{1}{3}$. Eye 4 times in length of head, $1\frac{1}{2}$ in length of snout, $1\frac{1}{4}$ interorbital width. Three series of scales on the cheek. About 35 scales in a longitudinal series. A black spot on the chin. Total length 95 millim.

Fig. 1.



a. *b'*. *b*.

Mastacembelidæ.

23. Mastacembelus moorii, sp. n. (Plate VII. fig. 1.)

Depth of body 14 times in total length, length of head (without rostral appendage) $6\frac{1}{3}$ times; vent equally distant from end of snout and base of caudal; length of head $2\frac{1}{2}$ to 3 times in its distance from vent, and $\frac{1}{2}$ in its distance from first dorsal spine. Snout 3 times as long as eye, ending in a trifid dermal appendage which is a little longer than eye; cleft of mouth extending to below centre of eye; no præopercular spines. Vertical fins united with the rounded caudal. Dorsal XXV–XXVII 70–80; spines very short. Anal II 70–80. Pectoral $\frac{1}{4}$ length of head. Scales very small, 30–35 between origin of soft dorsal and lateral line. Brown, tail with a wide-meshed blackish network; dorsal and anal whitish, with a vertical series of blackish spots or vertical bars; anal and caudal edged with blackish.

Total length 440 millim.

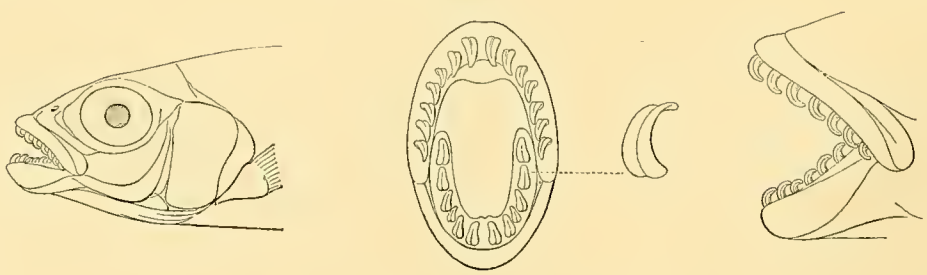
Two specimens from Mbity Rocks.

This species has been compared with *M. marmoratus*, Perugia, from the Congo, which differs in the more slender body (its depth contained 20 times in the total length) with larger scales, the shorter tail, the longer rostral appendage (measuring twice the diameter of the eye), and the higher number (30) of dorsal spines.

I think as many as 13 African species of *Mastacembelus* may be distinguished, as shown in the following synopsis:—

Plecodus, g. n.—Teeth large and few, in a single series, dilated at the base, truncated at the end, compressed, slightly grooved in front, curved and directed backwards; 14 teeth in the upper jaw, 12 in the lower; maxillary exposed. Scales moderate, cycloid. Dorsal with 19 spines, anal with 3.

Fig. 2.



Plecodus paradoxus, sp. n. (Fig. 2.)—D. XIX 14; anal III 12. Depth of body 4 times in total length, length of head $4\frac{1}{2}$. Eye large, longer than snout, $\frac{1}{3}$ length of head, $1\frac{1}{4}$ interorbital width; maxillary extending to below anterior third of eye; 3 series of scales on the cheek. Sc. 65 $\frac{6}{17}$; lat. l. $\frac{50}{40}$. Total length 90 millim.

I. Vent nearly equally distant from the end of the snout and the base of the caudal fin.

A. Two strong præopercular spines.

D. XXIII–XXIV 75; A. II 75–76; length of head (measured to extremity of opercle and without rostral appendage) hardly twice in its distance from vent and 6 times as great as its distance from the first dorsal spine . . . . . 1. *M. marchii* Sauv.

D. XXIV 100; A. II 100; length of head $3\frac{1}{2}$ times in its distance from vent, equal to its distance from the first dorsal spine . . . . . 2. *M. cryptacanthus* Gthr.

D. XXVII 85; A. III 92; length of head $2\frac{1}{2}$ in its distance from vent, 3 times as great as its distance from first dorsal spine . . . . . 3. *M. congicus* Blgr.[1]

D. XXVI–XXX 80; A. II 80 . . . . . 4. *M. liberiensis* Blgr.[2]

D. XXIX–XXX 117–130; A. II 117–127; length of head nearly 4 times in its distance from vent, and nearly twice as great as its distance from the first dorsal spine.

5. *M. loennbergii* Blgr.[3]

B. Præopercular spines minute (young) or absent.

D. XXVII–XXVIII 70–80; A. II 80–90; length of head 3 to 4 times in its distance from vent, equal to or a little less than its distance from the first dorsal spine.

6. *M. flavomarginatus* Blgr.[4]

D. XXVII 80–82; A. II 60–65; length of head equal to its distance from the first dorsal spine.

7. *M. niger* Sauv.

D. XXVII–XXIX 65–70; A. II 68–75; length of head $2\frac{1}{2}$ to 3 times in its distance from the vent, and $\frac{1}{2}$ in its distance from the first dorsal spine . . . 8. *M. shiranus* Gthr.

D. XXIX 95; A. II 85; length of head 3 times in its distance from the vent, and $\frac{1}{3}$ in its distance from the first dorsal spine . . . . . 9. *M. nigromarginatus* Blgr.[5]

D. XXV–XXVII 70–80; A. II 70–80; length of head twice in its distance from the vent, and nearly $\frac{1}{3}$ in its distance from the first dorsal spine . . . . 10. *M. moorii* Blgr.

II. Vent much nearer the caudal fin than the end of the snout; one or two præopercular spines.

D. XXX 85; A. II 70 . . . . . 11. *M. marmoratus* Perugia.[6]

D. XXXIII–XXXV 50–60; A. II 50–60 . . . . . 12. *M. tanganicæ* Gthr.

III. Vent much nearer the end of the snout than the caudal fin.

D. XXXI–XXXII 103; A. I 116 . . . . . 13. *M. ophidium* Gthr.

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[1] A species from the Upper Congo founded on a single specimen with mutilated tail and regenerated caudal fin. I have now a perfect specimen.

[2] *M. marchii* Steind. *nec* Sauv.—Liberia.

[3] *M. cryptacanthus* Loennberg *nec* Gthr.—Cameroon.

[4] A new species founded on specimens from the Gaboon previously referred to *M. cryptacanthus*.

[5] A new species founded on a single specimen from Ashantee.

[6] Type examined.—Vent equally distant from the head and from the caudal; head once and a half as long as its distance from the first dorsal spine; 17 scales between origin of soft dorsal and lateral line.

SILURIDÆ.

24. CLARIAS ANGUILLARIS L.

This species occurs in the Nile as well as in the Niger and the Ogowe. It is one of those Siluroids which are known to live a considerable time out of water and to make excursions on dry land after the manner of Eels.

25. CLARIAS LIOCEPHALUS, sp. n. (Plate VII. fig. 2.)

Vomerine teeth in a narrow band, without posterior process. Depth of body $5\frac{1}{2}$ times in total length, length of head 5 times. Head smooth, covered with soft skin, slightly longer than broad; occipital process very short, angular; diameter of eye 3 times in length of snout, 6 times in interorbital width; maxillary barbel as long as the head, nasal barbel a little shorter; inner mandibular barbel $\frac{3}{5}$ length of head. Dorsal 70. Anal 50. Caudal free. Pectoral $\frac{1}{2}$ length of head, not extending to the vertical of origin of dorsal fin. Uniform blackish brown.

Total length 80 millim.

A single specimen from Kinyamkolo.

26. ANOPLOPTERUS PLATYCHIR Gthr.

Two specimens from marshes near Mbity.

I have recently recorded the occurrence of this species in Lake Nyassa, and it has also been described by Vaillant as *Chimarrhoglanis leroyi*, from Mrogoro torrent, Urugaru Mountains, East Africa.

27. AUCHENASPIS BISCUTATA Geoffr.

Known from the Nile and the Senegal.

28. SYNODONTIS MULTIPUNCTATUS, sp. n. (Plate VIII.)

Præmaxillary teeth in 5 or 6 irregular transverse series; mandibular teeth in a single series of 16, feebly curved, simple, measuring hardly $\frac{1}{3}$ diameter of eye. Depth of body $3\frac{1}{4}$ times in total length, length of head $3\frac{2}{3}$. Head scarcely longer than broad, slightly convex on the crown; snout rounded, less than half length of head, twice as long as eye; eye supero-lateral, well visible from above, its diameter $4\frac{1}{2}$ times in length of head, twice in interorbital width. Gill-cleft very narrow, not extending below base of pectoral. Maxillary barbel simple, reaching a little beyond anterior third of pectoral spine; mandibular barbels strongly fringed, outer a little more than twice as long as inner, and half as long as maxillaries. Dorsal II 7; spine strong, a little shorter than the head, strongly serrated behind in its distal half. Adipose fin low, a little shorter than the head, twice as long as its distance from the dorsal. Humeral process simply granulate, sharply pointed, not

extending quite so far as the occipito-nuchal shield, which is $1\frac{1}{2}$ as long as broad and reaches the first soft ray of the dorsal. Anal III 7. Caudal deeply bifurcate. Skin smooth. Pale reddish brown above, with very numerous blackish-brown round spots, which are smallest on the head and nape; lower parts and barbels white, unspotted; ventrals yellow; dorsal and caudal broadly edged with yellow.

Total length 240 millim.

A single specimen from Sumbu.

29. Malapterurus electricus Gm.

The Electric Cat-fish is widely distributed, being on record from the Nile, the Niger, the Ogowe, and the Congo.

Cyprinidæ.

30. Labeo, sp. inc.

An unmistakable figure of a *Labeo* is among Mr. Moore's sketches, and although the specimen is not represented in the collection entrusted to me for description, I have included the fish as being the only representative of the Cyprinoids yet found in Tanganyika. The specimen from which the drawing was made was of large size, and therefore could not be preserved under the difficult circumstances to which allusion has been made in the introduction to this memoir.

Characinidæ.

31. Alestes macrolepidotus C. & V.

Occurs in the Nile, the Senegal, the Niger, and the Congo.

32. Alestes macrophthalmus Gthr.

This fish was known only from the Ogowe.

33. Hydrocyon forskali Cuv.

Occurs in the Nile, the Senegal, and the Niger.

Cyprinodontidæ.

34. Haplochilus tanganicanus, sp. n. (Plate VI. fig. 3.)

Body compressed, its depth 4 times in total length; length of head $4\frac{1}{3}$ times. Snout depressed; lower jaw projecting beyond the upper; eye a little longer than snout, a little shorter than interorbital width, 3 times in length of head. Dorsal 13, originating at equal distance from the head and the caudal fin; the first ray corresponds to the 18th scale of the lateral line; posterior rays longest, $\frac{2}{3}$ length of head. Anal 28, originating below extremity of pectoral. Pectoral $\frac{4}{5}$ length of head, extending far beyond root of ventral. Caudal feebly emarginate. Caudal peduncle twice as long as

deep. Scales 42 in a longitudinal line, 11 in a transverse line. Silvery, with a darker lateral stripe; dorsal and anal with greyish horizontal streaks.

Total length 80 millim.

A single specimen from Mbity Rocks.

Polypteridæ.

35. Polypterus bichir Geoffr. (?).

Mr. Moore informs me that a *Polypterus* occurs in moderate abundance in the lake, and although he did not bring home specimens, he feels tolerably confident, from his recollection of them, that the fish belongs to the typical *P. bichir*, which occurs in the Nile, the Niger, and the Congo, and not to any of the closely-allied species that are often confounded with it.

APPENDIX. By J. E. S. Moore.

In the foregoing description of the fishes which I succeeded in bringing through from Tanganyika to the coast, Mr. Boulenger has already alluded to the difficulties that were experienced in transporting them in spirit, through several hundred miles of often trackless, always scorching, forest, and of the inevitable losses which this entailed. The difficulties of transport, however, were by no means all. It must be nearly impossible for anyone who has not visited the African lakes to realize their huge size and oceanic character.

One must be as heavily equipped for dredging in these waters as would be required for effective operations in the open sea. It will easily be understood, therefore, how incomplete our knowledge of the deep-water fauna of these lakes must be considered, when it is remembered that on Tanganyika I was of necessity forced to work with native dug-out boats, and with nothing better than the natives themselves as motive power.

In the case of the fishes, moreover, there are no sources of collateral evidence from which we may obtain any insight into the nature of the deep-water forms, for dead fishes, unlike molluscs, leave no shells behind them, to be thrown upon the beaches of the lake, whereby, in the case of the molluscs, we gain some knowledge of the existence of forms which have not been seen alive; nor can we make use of the knowledge of the inhabitants in this matter, for the best of the Tanganyika natives are but wretched fishermen, merely using either surface traps, or light and inefficient drag-nets, which are thrown out a short distance from the shore and then hauled in to the land. Such nets are necessarily used only on smooth sandy beaches, and consequently the fishes caught in them are only of those species which inhabit places

of this description, and although they are numerically abundant, they belong to half a dozen species at the most.

Nearly all the new forms which I obtained were killed by dynamite from the craggy ledges of the west coast of the lake, where the water was deep enough, about 20–35 feet, but not too deep for my men to dive and procure the greater number of the fishes, which, after every shot, were invariably found on the bottom. The number of fishes in such situations is really surprising, and on several occasions, after firing a single cartridge, I obtained more than two tall negroes could well carry, when slung in a bag between them on a pole.

Only one fish was obtained from anything approaching to the deeper water of Tanganyika, about 400 feet, which was accidentally entangled in a basket dredge, and this was the specimen of the new species *Bathybates ferox* described on p. 15.

Of the fishes which exist on the great mud-plains, which are to be found about 1000 feet below the surface in many portions of the lake, or of those which may occur in the vastly deeper portions, absolutely nothing is known.

The fishes which have been collected, moreover, were obtained almost exclusively from the south-western extremity of Tanganyika, and to suppose that the fishes which occur in this locality are in any way representative of the fishes, even in similar situations, throughout the whole lake, would be as absurd as if we were to suppose that the shoal-water fish of the whole English Channel could be obtained from a few miles of rocky beach about the Needles and the Isle of Wight. That the fishes differ in different portions of the lake I have myself observed, and it has also been shown in a most striking manner by the fact that of the six species previously described from Tanganyika, which were collected by Captain Hore near Ujiji, I have only rediscovered one.

The fishes which have been already obtained in Tanganyika, or in Nyassa for that matter, must therefore be regarded as merely the surface skimmings of these lakes, and as in no sense representing the whole fish-fauna they may contain.

Really deep water, 300 fathoms and upwards, is to be found over large areas in Nyassa, and to what depth the water in Tanganyika may reach no one knows; but it is obvious that where water of such depth exists, if the lakes in which it is contained have been permanent for any great length of time, there ought to be modified forms of the freshwater fishes to suit such depths, and, with the exception of *Bathybates ferox*, these have not yet been obtained.

In the case of Tanganyika, the interest which attaches to the future exploration of its deeper water is particularly great, since I have elsewhere shown that the majority of the Halolimnic animals, most of the molluscs, sponges, and so forth, are exclusively deep-water forms. In fact, it was only when my dredging capacities, so to speak, were giving out, that the more interesting of these forms, the genera *Typhobia*, *Bathanalia*, and the like, were beginning to come in.

That there are no Halolimnic representatives among the fishes which have hitherto been obtained is no evidence that other fishes of a widely different and possibly of a Halolimnic type may not in future be secured. On the other hand, the fact that the Teleostean fishes now existing in Lake Tanganyika should not correspond with the Molluscan section of the Halolimnic group is really what one would expect; for, as I have recently shown [1], the facies of the Molluscan section of the Halolimnic group is almost, if not quite, indistinguishable from that of the Jurassic seas. Except the Herring-like *Leptolepidæ*, few, if any, Teleostean fishes are represented in Jurassic beds, and we should therefore expect the piscine accompaniments of the Halolimnic molluscs to be entirely composed of Ganoids and the like. I found a species of *Polypterus*, which I took to be *P. bichir*, abundant on the southern shores of Lake Tanganyika, and it is quite possible that some of the active carnivorous fishes which inhabit the open water may be Ganoids too. What the fish is that so much surprised Glaive, when he crossed the lake, by attacking the paddles of his boat, is quite unknown, but I myself saw these same fishes attack the paddles of my own boat, not 20 miles from the spot where Glaive described them, on the west coast of the lake.

Judging, therefore, from the incomplete character of our knowledge of the fish-fauna of Lake Tanganyika, and from the vast antiquity of the lake, as evidenced by the Jurassic facies of its molluscan shells, it is only natural to expect that future exploration may reveal, among these fishes, forms that are of the highest scientific interest from a morphological point of view. I mean that Tanganyika and its neighbourhood present one of those few localities where it is legitimate to expect that we may discover many forms that in most places have become extinct.

Our very slight acquaintance with the surface-forms existing in Nyassa and Tanganyika, and the complete absence of all knowledge of the contents of the deep waters of these lakes, unfortunately by no means exhausts the sum of our present ignorance of these matters. We have no real knowledge of the extent of the Halolimnic fauna, beyond the lake in which it was originally discovered. I have shown only that this fauná is not present in Nyassa nor in Shirwa, nor yet even in the little lake Kela, not more than 20 miles from the Tanganyika shore, and that it is extremely probable that it does not extend to Mwero and Lake Bangweolo to the west. But for anything that can actually be shown to the contrary, it may be present in Lake Rukwa to the east, and in the Albert and Albert Edward Nyanzas to the north, and it is perhaps almost to be expected that some representatives of this stock should be found in Lake Kivu, which lies in the same great valley not more than 50 miles to the north of Tanganyika. But what is the relation of this lake, the effluent of which flows south into Tanganyika, to the Albert and Albert Edward Nyanzas, with effluents flowing into the Nile, towards the north? All that

[1] "On the Hypothesis that Lake Tanganyika represents an old Jurassic Sea," Quart. Journ. Microsc. Sci. xli. no. 162, June 1898.

we know at present is that the watershed between these lakes is situated in their common valley, and that the whole series of lakes, from Tanganyika in the south to the Albert Edward in the north, appears to lie in one continuous valley-system, which owes its origin to a single geological movement, that has affected, although it may be at very different times, an immense area of ground, and reaches at the present time actually to the shores of the Red Sea.

The lakes which lie in these valleys immediately to the north of Tanganyika are therefore of especial zoological interest, for it may be that in these isolated sheets of water there exist animals analogous to those which constitute the Jurassic Halolimnic fauna of Tanganyika itself. The similarity of the Halolimnic gastropods to those of the Jurassic seas is, as I have insisted elsewhere, so complete and so remarkable that no effort should be spared which may throw light on the real nature and origin of these forms.

The only geographical fact which is at present available is this, that there exists a certain similarity in the fish-fauna of Tanganyika to that of the lower Nile, and it may be that this is an indication that at some time the Nile watershed was further south, and drained out of Tanganyika to the north, in which case Halolimnic animals will without doubt be found among the lakes towards the north. All this is, however, little more than mere conjecture, but it will help my present purpose if it renders more apparent the extreme desirability of becoming better acquainted with the zoology of the lakes in the Rift valleys immediately to the north of Tanganyika.

The presence of a Halolimnic fauna in Lake Tanganyika, as something superadded to the normal freshwater stock of the lake, is at present the central fact, and if the expectations which the morphological characters of those Halolimnic animals already known have raised should be fulfilled, we have something here which may completely change our views respecting the past history of the continent, and provide morphology with some most unique and valuable comparative material.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. *Lates microlepis*, p. 6.
Fig. 2. *Lamprologus fasciatus*, p. 7.
Fig. 3. „ *compressiceps*, p. 7.
Fig. 4. „ *moorii*, p. 8.
Fig. 5. „ *modestus*, p. 8.
Fig. 6. „ *elongatus*, p. 9.

PLATE II.

Fig. 1. *Lamprologus furcifer*, p. 9.
Fig. 2. *Telmatochromis vittatus*, p. 10.

Fig. 3. *Telmatochromis temporalis*, p. 11.
Fig. 3 *a*. „ „ dentition.
Fig. 3 *b*. „ „ skeleton.
Fig. 4. *Julidochromis ornatus*, p. 12.
Fig. 4 *a*. „ „ dentition.
Fig. 4 *b*. „ „ skeleton.

PLATE III.

Fig. 1. *Paratilapia pfefferi*, p. 12.
Fig. 2. „ *macrops*, p. 13.
Fig. 3. „ *ventralis*, p. 13.
Fig. 4. „ *leptosoma*, p. 14.
Fig. 5. *Eretmodus cyanostictus*, p. 16.
Fig. 5 *a*. „ „ dentition.
Fig. 5 *b*. „ „ skeleton.

PLATE IV.

Fig. 1. *Paratilapia furcifer*, p. 14.
Fig. 2. *Bathybates ferox*, p. 15.
Fig. 2 *a*. „ „ dentition.

PLATE V.

Fig. 1. *Tilapia labiata*, p. 17.
Fig. 2. *Tropheus moorii*, p. 18.
Fig. 2 *a*. „ „ dentition.
Fig. 2 *b*. „ „ skeleton.

PLATE VI.

Fig. 1. *Petrochromis polyodon*, p. 20.
Fig. 1 *a*. „ „ dentition.
Fig. 1 *b*. „ „ skeleton.
Fig. 2. *Perissodus microlepis*, p. 21.
Fig. 2 *a*. „ „ dentition.
Fig. 3. *Haplochilus tanganicanus*, p. 25.

PLATE VII.

Fig. 1. *Mastacembelus moorii*, p. 22.
Fig. 2. *Clarias liocephalus*, p. 24.
Fig. 2 *a*. „ „ upper view of head and nape. Magnified (×3).

PLATE VIII.

Synodontis multipunctatus, p. 24, with lower view of head.